UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/987,918	11/16/2001	Mark R. Stevens	10013075-1	7937

7590 01/03/2006

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER	
LAROSE, COLIN M	

ART UNIT	PAPER NUMBER
2627	

DATE MAILED: 01/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/987,918
Filing Date: November 16, 2001
Appellant(s): STEVENS ET AL.

John P. Wagner, Jr.
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 10/11/05 appealing from the Office action mailed 7/13/05.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,985,856	KAUFMAN ET AL	1-1991
6,721,449	KRISHNAMACHARI	4-2004
6,691,126	SYEDA-MAHMOOD	2-2004
6,711,288	KIM ET AL	3-2004

Moghaddam et al. "Image Retrieval with Local and Spatial Queries" Proceedings of the 2000 International Conference on Image Processing, vol2 (Sep 2000), pp. 542-545.

Swain et al. "Color Indexing" International Journal of Computer Vision, vol7, no. 1 (1991), pp. 11-32.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims (reprinted from the Final Rejection dated 7/13/05):

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-11, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,721,449 by Krishnamachari in view of "Image Retrieval with Local and Spatial Queries" by Moghaddam et al. ("Moghaddam").

Regarding claims 1 and 19, Krishnamachari discloses a method of measuring color consistency comprising:

obtaining a first 2-D image and a second 2-D image of an object (figure 1: a target image and a reference image of an object from a database are obtained);

subdividing the first image into a first set of partitions and the second image into a second set of image partitions, each partition having a color (i.e. each of the first and second images are partitioned into pixels ("partitions"), each pixel having a color);

selecting a first subset of image partitions in the first set of image partitions (e.g. a first image block as one of 4x4, 8x8, or 16x16 image blocks is a first subset of pixels in the target image) and a second subset of image partitions in the second set of image partitions (e.g. a second image block as one of 4x4, 8x8, or 16x16 image blocks is a second subset of pixels in the reference image) (see column 4, line 59 through column 5, line 13);

assigning each image partition in the first subset and each image partition in the second subset a color value corresponding to the color of the image partition (column 4, lines 33-58: pixels in each block are assigned CIELAB or CIELUV color values based on their respective colors);

placing each image partition in the first subset in one of a first series of histogram subdivisions and each image partition in the second subset in one of a second series of histogram subdivisions based on the color value of each image partition (column 5, lines 14-34: for each of the first and second image blocks, an histogram is generated whereby pixels in each block are accumulated into histogram subdivisions based on color values of the pixels);

comparing the first series of histogram subdivisions to the second series of histogram subdivisions (column 5, lines 25-34: the histograms of corresponding image blocks in the target and reference images are compared based on the "proportion of occurrences" of the colors therein, thereby effecting a comparison of the histogram bins ("subdivisions") for corresponding blocks in each of the two images);

processing the second image based on whether the first series of histogram subdivisions and the second series of histogram subdivisions have a similarity (column 6, lines 19-29: if the first and second series of histograms subdivisions are similar (as well as other corresponding series pairs), then the reference image is identified as being similar to the target image, and is processed so that it is displayed in a list of similar images).

Krishnamachari is silent to selecting the blocks ("subsets") of pixels ("image partitions") "based upon criteria related to a 3-D region of the object" and processing "the region" based on whether the pair of series of histogram subdivisions is similar.

Moghaddam discloses a content-based image retrieval system, similar to that of Krishnamachari, in which database images that are substantially similar to a target image are retrieved. Moghaddam, like Krishnamachari, utilizes local color histograms in order to effect a comparison between a target and a reference image.

Moghaddam also discloses the feature of allowing a user to specify regions of interest which serve as search criteria and lead to "a more powerful search engine." See § 1. As shown in figure 1, a user can select region(s) of interest corresponding to three-dimensional objects in a scene. Those regions of interest are then processed using local histogram measures, as shown in figure 2. The histograms of those regions are then matched to histograms of the reference images in order to find a sufficiently matching image.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari by Moghaddam to select the subsets of image partitions "based upon criteria related to a 3-D region of the object" and process "the region" based on whether the pair of series of histogram subdivisions is similar since Moghaddam discloses that selecting subsets

of image partitions in a target image based on a region of a 3-D object according to a user's preference and then processing (e.g. retrieving and displaying) the region based on the similarity between histogram subdivisions of the target and reference images produces "a more powerful search engine"; a user is allowed to specify arbitrary regions of objects to be retrieved rather than relying on a computer to specify the regions (see Abstract and § 1).

Regarding claim 2, Krishnamachari discloses that the obtaining step comprises obtaining images of a scene as the object (figure 1: "target image" and reference image(s) in the "image database" are images of scenes).

Regarding claim 3, Krishnamachari discloses subdividing the first and second image into pixels (i.e. the images are digital images, which are divided into pixels).

Regarding claim 5, Moghaddam discloses that only the pixels located in the region are selected (see figure 2(b)).

Regarding claim 6, Krishnamachari discloses assigning an array value as the color value (column 4, lines 33-59: e.g. LUV array value).

Regarding claim 7, Krishnamachari discloses assigning a 3-D array value (i.e. LUV is a 3-D array).

Regarding claim 8, Krishnamachari discloses that utilizing R, G, and B values is conventional (column 1, lines 35-45).

Regarding claim 9, Krishnamachari discloses that the RGB values are typically 24 bits, so that the values of each color range from 0-255 (column 1, lines 35-45).

Regarding claim 10, Krishnamachari discloses combining the R, G, and B values into a smaller number of agglomerate values (column 1, lines 55-64).

Regarding claim 11, Krishnamachari discloses that combining portions of the first and second histogram subdivisions into a first and second series of histogram partitions is conventional (column 1, lines 47-67: the 24-bit RGB values, representing millions of colors, are quantized into 64 colors so that the millions of histogram subdivisions for each image are combined to form 64 partitions → in other words, portions of the first and second histogram subdivisions (i.e. different groups of the histogram bins) are combined into a series of histogram partitions (i.e. the groups each combine to from one of 64 partitions)).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of U.S. Patent 4,985,856 by Kaufman et al. ("Kaufman").

Regarding claim 4, Krishnamachari and Moghaddam are silent to selecting the subset based on criteria related to a voxel region of the object.

Kaufman discloses a 3-D image storage and retrieval system. Rather than storing conventional 2-D image data, Kaufman's system is operative to store and retrieve 3-D image data composed of voxels.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Kaufman to select a the subsets based on criteria related to a voxel region, rather than criteria related to a pixel region, since Kaufman discloses

that it is desirable to represent images in 3-D with voxels and store and retrieve such images (see column 2, lines 56-66 and column 9, lines 45-52).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of U.S. Patent 6,691,126 by Syeda-Mahmood.

Regarding claim 15, Krishnamachari and Moghaddam are silent to the object including a Lamertian surface.

Syeda-Mahmood discloses an image processing system for locating objects in a video database. In particular, Sydea-Mahmood discloses methods by which Lambertian surfaces are modeled and retrieved in a video database (see column 6, lines 41-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Syeda-Mahmood to choose the object to include a Lambertian surface, since Krishnamachari and Moghaddam disclose that any arbitrary object in an image may be obtained for retrieval purposes, and Syeda-Mahmood shows that it is conventional to retrieve objects that represent Lamertian surfaces.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of "Color Indexing" by Swain et al. ("Swain").

Regarding claim 14, Krishnamachari is silent to comparing corresponding histogram subdivisions, as claimed.

Swain discloses the conventional manner in which histograms are compared. At § 3.1.1, Swain discloses that histograms are compared by comparing corresponding histogram subdivisions via a "min" function to see if each subdivision contains at least one pixel.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Swain to compare histograms as claimed, since Swain shows that comparing corresponding histogram subdivisions to ascertain whether pixels are present in each of the bins is a conventional technique for effecting a comparison of histograms.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamachari in view of Moghaddam, and further in view of U.S. Patent 6,711,288 by Kim et al. ("Kim").

Regarding claim 17, neither Krishnamachari nor Moghaddam discloses assigning a uniform region color to the entire region in the object.

Kim discloses a method for designating a local representative color value for image regions in order to facilitate image retrieval. In particular, Kim discloses assigning uniform region colors to each of the image regions based on the local color histogram (see figure 2A, block S52). Then, the local representative color of each region is used to select an optimal searching algorithm.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Krishnamachari and Moghaddam by Kim to assign the region a uniform color since Kim discloses that utilizing local representative colors (i.e. uniform region colors) allows an optimal search algorithm to be automatically ascertained (see column 3, lines 18-25).

(10) Response to Argument

Regarding claim 1, Appellant presents the following arguments:

(1) Krishnamachari does not obtain first and second 2-D images "of an object," as claimed (see pp. 5-6 of the Brief);

(2) Krishnamachari does not "process the region," as claimed (see pp. 6-7 of the Brief);

(3) one skilled in the art would not have been motivated to modify Krishnamachari to achieve the claimed invention (see pp. 7-8 of the Brief);

(4) the combination of Krishnamachari fails to teach or suggest all of the claim limitations (see pp. 8-9 of the Brief); and

(5) Moghaddam does not teach selecting the first and second subsets of image partitions "based upon criteria related to a 3-D region of the object," as claimed (see p. 9 of the Brief).

Regarding the **first argument**, Applicant argues that Krishnamachari does not disclose obtaining first and second 2-D images of an object. Applicant asserts that Krishnamachari's image retrieval system "does not teach, describe or suggest that target image 101 and any of the images 111 (in the retrieval database) are of the same object" (see Brief, p. 5).

It is true that Krishnamachari does not *expressly* disclose that any of the database images are of the same object as the target image. However, the converse is also true in that Krishnamachari does not expressly disclose that all the images in the database are not of the same object as the target image. Nevertheless, the stated purpose of Krishnamachari's system is to retrieve images from a database that are most similar ~~to~~ or same a target image.

For example, Krishnamachari's system is operative to store a database of images of paintings; the user then provides a target image of a painting. The target image may be an unknown painting, and the user wishes identify it; or the user may be familiar with the painting and wants to know whether an image of the painting is in the database. Krishnamachari's system then compares a color histogram of the target image to a color histogram of each of the images in the database. The system then retrieves the images in the database that are most similar or same to the target image based on the comparison.

As mentioned above, Krishnamachari does not expressly state that the target image is of the same object as any of the database images. However, such a limitation is so easily inferred as to be implicit in Krishnamachari's disclosure. In the above example, the target image and a database image may very well be of the same object (i.e. painting). If that is the case, then the system will report that the target image and the database image of the same painting are substantially similar. On the other hand, if the painting in the target image is not found in any of the database images, then the system may not find any of the images in the database to be similar; however, there may be other images of paintings in the database that use similar colors or that are by the same artist so that the system does find a database image(s) to be similar, although not identical, to the target image.

Such is the operation of Krishnamachari's system – it does not require that any of the database images are of the same object as the target image, but this limitation would have been implicit to those skilled in the art, since the purpose of Krishnamachari's retrieval system is to identify any database images that match a provided target image. Whether there exist any images in the database that are of the same object as contained in the target image will be determined by

the specific implementation and environment in which Krishnamachari's invention is practiced. Those skilled in the art, upon reading Krishnamachari's disclosure, would have easily known that, since the purpose of the system is to retrieve images similar to a target image, retrieving images that are identical and of the same object as contained in a target image was so well within scope of Krishnamachari's teachings as to be implicit therein.

Regarding the **second** argument, Applicant argues that Krishnamachari does not disclose processing a region, since Krishnamachari's disclosure is directed to processing entire images. As stated in the Final Rejection reprinted above, Krishnamachari is not considered to teach this feature. Therefore, the Moghaddam reference was relied upon as providing the requisite teaching and motivation for processing regions of interest (ROIs) in an image rather than entire images.

Regarding the **third** argument, Applicant argues that one skilled in the art would not have been motivated to combine the teachings of Krishnamachari and Moghaddam to achieve the claimed invention. Examiner maintains that there is sufficient motivation to combine the teachings of the two references. Both are related to content-based image retrieval, and more specifically, both are related to content-based image retrieval involving the comparison of color histograms between images in a database and a target image.

Applicant asserts that, in contrast to Krishnamachari and Moghaddam, "the present invention is used for determining color consistency of regions of images of the same object for use in 3-D modeling" (Brief, p. 8). Examiner appreciates the differences between the disclosed invention and the teachings of Krishnamachari and Moghaddam. However, in the Examiner's

opinion, the claimed invention is an obvious combination of the prior art image query and retrieval systems taught by Krishnamachari and Moghaddam. That is, the invention, as claimed in claim 1, does not differentiate a method of measuring color consistency for image retrieval from a method of measuring color consistency for 3-D modeling. The claim merely calls for comparing the histograms of an object region in two images of the same object, and then processing the region based whether the histograms are similar. In the claim, there are no details regarding how the image is "processed" that would differentiate the claim as a method involving 3-D modeling from a method involving image retrieval.

Regarding the **fourth** argument, Appellant asserts that the combination of Krishnamachari and Moghaddam does not teach all of the claimed limitations because Moghaddam does not teach or suggest obtaining first and second 2-D images "of an object," as claimed. In response, this limitation was addressed for the first argument above, and Krishnamachari was considered to disclose this feature at least implicitly for the reasons given.

Appellant also asserts that Moghaddam does not teach or suggest, "processing" the region based on whether the first and second series of histogram subdivisions have a similarity. In response, Moghaddam is considered to "process" the region, as claimed. As stated in the Final Rejection reprinted above, Moghaddam "processes" the region of interest at least by retrieving it and displaying it (e.g. figs. 5 and 6). In other words, upon ascertaining a match for the region of interest, a region corresponding to the match is retrieved from the database and then displayed for a user to view. Retrieving and displaying a matching region is considered to be "processing"

the region since the claim does not specify any details of the "processing" and only nominally recites "processing the region."

Regarding the **fifth** argument, Appellant asserts that Moghaddam does not teach selecting the first and second subsets of image partitions "based upon criteria related to a 3-D region of the object," as claimed (see p. 9 of the Brief). Appellant asserts that Moghaddam instead utilizes 2-D "spatial information" in selecting a subset of the partitions, as shown in figure 4.

Examiner agrees that Moghaddam does utilize 2-D spatial information in selecting, however, when the claim limitation is given its broadest reasonable scope, it does read on Moghaddam's process for selecting the subsets of image partitions.

The claim calls for "selecting a first ... and a second subset ... based upon a criteria *related* to a three-dimensional region of the object." (*emphasis added*) In other words, the subsets are selected using criteria that are somehow related to a 3-D region of the object. Figure 1 of Moghaddam illustrates such a selection. It shows a dog sitting underneath an archway. The archway and the dog are both real-world 3-D objects. The image of the dog and the archway is represented by a 2-D configuration of pixels, but this does not negative the fact that, as shown, as user makes a selection based upon criteria *related* to the dog and the archway. That is, regions are selected based on the positioning of the dog and the archway. As such, the positioning of the dog and the archway are considered *criteria* that are *related* to the 3-D object regions within the 2-D image.

None of Appellant's arguments regarding the remaining claims raise other issues. Therefore, the rejection of these claims should be maintained for the reasons set forth above in the reprinted Final Rejection and the above rebuttal of Appellant's five arguments.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Colin LaRose

Conferees:

Joe Mancuso

Jingge Wu